Single-Thread Processor

									į													1		-			-	l		ŀ	ŀ	L	L	L				
Copy outpoor	-	3	4	2	S	7	8	0	2	=	12	13	14	15 1	16 1	17 1	18 1	19	20 2	21	22 2	23 2	24 2	25 26	6 27	7 28	3 29	30	<u>ب</u>	32	33	34	35	38	37	38	33	8
2000				1	ш	ш	u	ш	ш	ш	Ŀ	<u></u>	u.	4	14.	11.	u_	0	O	9	G	Ī	I	エ	エ	エ	-	_	_		_	_	7	7	7	-	1	
TLUE	-) 4	-		_	1	Δ	۵	۵	۵	ш	ш	ш	ш	ш	ш	E	IL.	ш	u.	L	9	0	O	9	(0)	T	I	I	I	I	I	-	-	-	-		
DECODE.			+	U			U	O	U	۵	۵	_	_	٥	_ G	ш	ш	ш	ш	111	ш	<u>_</u>	ш	ᄔ	ш.	и.	0	0	O	O	0	(1)	エ	I	I	I	ェ	
OPERAND	\vdash						œ	60	8	U	U	U	υ	υ	U	٥	۵	۵	۵	۵	۵	ш	ш	ш	ш	ш	u.	-	u.	-	ч	ш.	O	ტ	Ø	O	O	O
TICEXE	-	\vdash	-	├-						ю	-	-			_	Ų		_			-	۵		-	\dashv	-	Ш			-		-	ш					
- VE CO. F.	+	+	+	-	+-			Γ		-	α		-	-		Щ	- 0			_	_	_	۵	_			-	ш						ட				
AUDIKESS	+	+	+	1	4		1	1	T	\dagger	+	1	+	t	+	+	╀	1	-	H	+	+	F	-	-	<u> </u>	-	L	ш	_	L	_			ц			
MEM	_					4					+	6	+	+	+	+	+	اد	+	+	-	+	+	1	+	+	+	+	1	+	1	\downarrow	L	1		1	Γ	
1 10 1	-	-	-	_			۵												O		_		-	_	_		_	_	_	ш	_					-		
IVIE IVI	\dagger	+	+	+	1	I			T	T	t	\dagger	╀	+	+	+	+	r	⊢	(-	-	H	-	2	_	_			ш.						u.	
MEM		-		_				<	1	1	1	+	+	n	+	+	+	†	+	ار	+	+	+	+	1	+	+	+	+	+	-	L	Ļ					1
WOITERACK	-		_						٧									-		_	O		-	-	-	۵		-	-	\dashv	-	ш	1	4			T	-
WILLEGACA	+	+	+	\vdash		L		Γ				\vdash	-		-	-	-	-	-																			ļ
-	+	+	+	+	_	-	-	-		1	T	†-	1-	+-	+	+	+	-	ļ-	-		-	+	-	+	-	-	-	-	_	_		_		1	-	-	
memory in use	-	_	_		_	-	-	-			1	-	-	-	1	1	1	-	1	-	1	1	1	-			-											

Figure 1a

Single-Thread Processor with Data Cache

He cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 35 35 37 35 37 35 35 35 35 35 35 35 35 35 35 35 35 35	_	_	_	_	,	_				_	_	_			
He cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 35 35 35 35 35 35 35 35 35 35 35 35	₹	۵	1	0	Ŀ	Z	Σ	i 		L	_	L	_		
Heyde I 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 35 35 35 35 35 35 35 35 35 35 35 35	3	۵	-	0	1	z	2	1			_				
He Cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27 28 29 31 32 33 34 35 34 35 34 35 34 35 36 36 36 36 36 46 11 1 </td <td>ş</td> <td>٥</td> <td>-</td> <td>0</td> <td></td> <td>Z</td> <td>2</td> <td>Ī</td> <td>ب</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	ş	٥	-	0		Z	2	Ī	ب						
He cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21 22 22 22 22 22 22 22 22 22 23 23 34 25 35 34 35 35 36 35 36 35 36 35 36 36 36 36 36 36 36 36 36 36 36 36 36	2	C	7	z		Σ	-	1					¥		
He cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 A B C C D E E E F F F G G G H H H I I I I J J J J K K K L L L M M M N N N N O C C D D D D E E E F F F G G G H H H I I I I J J J K K K L L L L M N N N N N N N N N N N N N N N	_	C	7	z		Σ	_	1	_	Ī	¥	-			
He Cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 16 16 17 18 19 20 21 22 23 24 25 27 28 29 30 31 32 33 34 Record A B C	\rightarrow	(5	z	•	Σ	-	4	¥			T	-		
He Cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 31 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 31 32 33 <td></td> <td>2</td> <td>z</td> <td>Σ</td> <td>t</td> <td>_</td> <td>۷</td> <td>4</td> <td></td> <td></td> <td></td> <td>Ī</td> <td>-</td> <td>١</td> <td></td>		2	z	Σ	t	_	۷	4				Ī	-	١	
He cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 9 20 21 22 23 24 25 26 27 28 29 30 31 31	3	2	2	2	İ	_	>	4	_	Ī	-	,		1	
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 30 30 30 30 30 30 30 30 30 30 30 30	32	7	z	Ν	Ī	-	>	4	-	1					
He Cycle 1	3	7	Ξ	-	1	ㅗ	-	2		T		Ī	_	1	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29		1	٤	_	1	×	-	7		T	_	1			
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 15 17 18 19 20 21 22 23 24 25 26 27 28 A B C C C C D D D C E E F F F G G G H H H H I I I I I I I I I I I I I	_	-	7	_		¥	-	5	-	-		1	_	1	
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 Secondary			4	7	1	_	-	-		t			3	1	
He Cycle 1 2 3 4 5 6 7 8 9 10 11 12 14 16 16 17 18 19 20 21 22 23 24 25 26 26 26 20 11 18 1	_	Ì.	4	7	4	_	-	-		1	_	=		1	
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 Ne cycle 2 2 2 2 2 2 2 2 2		Ì.	_	_	4	->	٠.	_	1	1		1		1	
He Cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 15 17 18 19 20 21 22 23 24		:	×	_	5	_	:	Ξ	_	-		1	(9	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 No cycle 2 2 2 2 2 2 2 2 2		+	×	-	7	_	:	I			(5		1	
Necycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22		+	¥	-	2	_	:	Ξ	C	9	_			1	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21		-	_	-	-	I	1	5		1			t	4	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 No cycle 1 2 2 2 2 2 2 2 2 2		+	_		_	I	t	g			L	-		1	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19			_	-	4	I		U	L	-				1	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	_	+	_	:	I	C	,	ı	-	1			1	ц	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 17 18 14 15 16 17 18 18 18 18 18 18 18		4	_	:		ď	5	ı			ı	ш		1	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	_	+	_	:	Ξ	ď	,	u.	ı	u	r		T	-	
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 No cycle 1 2 3 4 5 6 7 8 8 8 8 8 8 8 8 8		1	I	1	5	ш	t	ш		_	-		,	٥	
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 13 14				H	-	ш	1	ш	l		-				
No cycle 1 2 3 4 5 6 7 8 9 10 11 12 13			_	⊦	-	⊢	+	ш	1	_	H	-		-	
Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 Ne cycle 1 2 3 4 5 6 7 8 9 10 11 12 Ne cycle 2 2 3 4 5 6 7 6 6 6 Ne cycle 3 4 5 6 7 6 6 6 Ne cycle 3 4 5 6 7 6 6 Ne cycle 3 4 7 8 7 7 Ne cycle 3 4 7 7 Ne cycle 3 4 7 7 Ne cycle 3 7 7 Ne cycle 3 7 7 Ne cycle 3 Ne		+	_	╀			1	۵	-	_	ŀ		r	ပ	
No Cycle 1 2 3 4 5 6 7 8 9 10 11 No Cycle 1 2 3 4 5 6 7 8 9 10 11 No Cycle 1 2 3 4 5 6 7 8 9 10 11 No Cycle 1 2 3 4 5 6 7 8 7 6 No Cycle 1 2 3 4 5 6 7 6 7 No Cycle 1 3 3 4 5 6 7 7 No Cycle 1 3 4 7 7 7 No Cycle 1 3 7 7 No Cycle 1 7 7 7 No Cycle 1	_	-	_	╀	ı	-	+		⊦			o			
No Cycle 1 2 3 4 5 6 7 8 9 10 No Cycle 1 2 3 4 5 6 7 8 9 10 No Cycle 1 2 3 4 5 6 7 8 9 10 No Cycle 1 2 3 4 5 6 7 8 9 10 No Cycle 1 2 3 4 5 6 7 8 7 No Cycle 1 2 3 4 5 6 7 8 7 No Cycle 1 2 3 4 7 8 7 No Cycle 1 2 3 4 7 8 7 No Cycle 1 2 3 4 7 7 No Cycle 1 2 3 4 7 7 No Cycle 1 2 3 4 7 No Cycle 1 2 3 4 7 No Cycle 1 3 4 No Cycle 1 3 No Cycle 1 No Cycle 1 3 No Cycle 1	+	_	╀	u.	H	+		╁╴	0	-		-			
Becyde 1 2 3 4 5 6 7 8 9 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		5		+	_	-	+		╀		t		-	00	
Becyde 1 2 3 4 5 6 7 8 F F F F F F F F F F F F F F F F F F				╀	_	⊢	5		╀	_	t	α	l	_	
Be Cycle 1 2 3 4 5 6 7 A B C D E E E B C D C C B C C C A B C C C A B C C C A B C C C A B C C B B B B B		+	ш	†	ш	6	1		+	α	1		t		
CODE CODE A B C D E E CODE CODE A B C D D CODE A B C D D CODE CODE A B C D D CODE A B C C C C C C C C C C C C C C C C C C	_	,	ш	1	0	,	1	α	1	-	1		t	۷	
Control of the contro		5	 نا	4	٥		5	a	,	-	t	4	†	_	1
Contraction of the contraction o	ч	,	ы		_	,	د	α	+	٥			t		١
Code 1 2 3 Code 1 2 3 Code 1 2 3 Code 1 2 3 Code A B Code		4	_	1	_ C	,	n	4	<		+	-			1
codune cycle 1 2 8 8 8 1 1 2 1 1 1 2 1 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1		2	()	α	١.	4		+		-		1		1
cochine cycle 1 COCODE PERAND (ECUTE (ECUTE RITEBACK	c	7	С		4	+	1		+		+	_	1		١
ccobe PERAND (ECUTE POPERS) PRESS	_	_	-	<		-	-		+		+	_	-	-	1
		machine cyde	000	١	TOTON		DECODE	0.440	Chenaro	THE CHANGE	מעברטוב	000000	AUDUESS	WOITERACK	TAN LEDVAN

Figure 1b

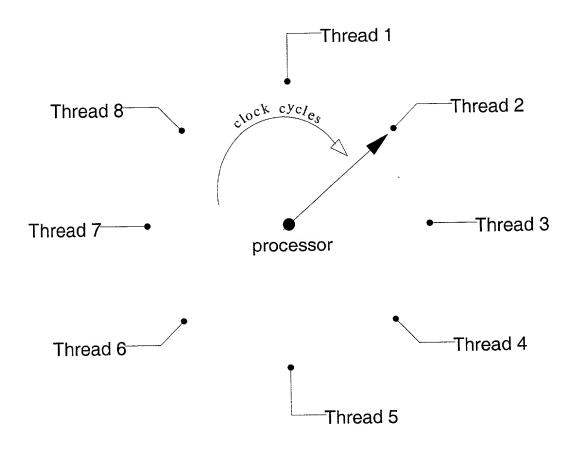


Figure 2

Four-Thread Processor

Γ	4			-T	Т	-	T	9	\neg		ပ္က	1	\neg
ŀ	3	띩	프	9	30	22	40	7	-	ဒ္ထ	-	-	3
\mid	2	2E 3	4D 1	3D 4	2D 3		4C 4	\dashv	SC	-	十	\dashv	3
ŀ		JE 2	4D 4	30	20 2	10	4C 4	30			χ		3
ŀ	4	40	3D 4	2D	10	4	30.	(,,		200	Ť	-	2
ł	60	3E 4	30	2D 2	2	4C	ည္က		22	-	1		2
ŀ	2	ZE 3	30	2D 2	<u>ā</u>	Q 7	ည္က	2C			2		2
-		빌	8	JO.	Q Q	200	2C			2			-
-	4	9	2D ;	٩	Q ,	သ္ထ	ည္က		ပ			_	-
ŀ	6	8	2	4C 1D	4	သ္ထ	1C 2C 2C	ō			48		-
Ì	7	2D	9	4	30	g	2			8			4
I	-	끧	2	4	သ္ထ	2C 2C 2C	ပ		4B				4
l	4	Q	Ą	ဘ္ထ	ပ္ထ	22	ဂ	48			38		4
	3	8	Q	ပ္က	S	2	48			38			3
أ	2	Я	Ą	ပ္ထ	2C 2C 2C	5	4B	-	38				က
		10	Ą	2C	2C	5	48	38			28		က
2	4	4C	ပ္ထ	1C 2C 2C	1C 1C 1C	48	38			28			2
١	က	3D	သ္ထ	22	5	48	38		2B				2
	2	20	20	10		48	38	2B			B		2
	1	2	2C	5	4B	38	2B		L.	8			-
	4	Ą	2C	10	4B	38	2B		=				_
TOCCOOT T COOTILIT	3	ဘ္တ	20	10	48	38	28	29			4		-
3	2	သူ	2	48	38	2B	82			4			4
•	_	9	10	48	38	2B	2		4				4
7	4	8	2	48	38	2B	9	4 4		L	₹	_	4
	က	သ္ထ	4B	88	88	18	4 A		_	8,	<u> </u>		3 3
750	2	20	48	38	28	18	4		8	_		L	
3	_	Σ	89	89	28	18	4		<u> </u>		2 ×		က
ر	4	1		2B	18	44	3A		ļ.,	2 A	<u> </u>	-	2
7	3		-	2B	18	4 A			2A	-		L	2 2
	2	20	28	3 2B		44	38	2A	1	-	_	-	-
	4	2	3 2B	18		3A 3A	2A 2A	_	4	1	-	-	 -
		+ -	+	-				4	_		-	-	-
	-	3 38	+			34	A 2 A	-	+	-	┢	-	╀
	F	1 '		A 4A		1A 2A	-		+-	-	├	-	-
	H	-	4	Α	A 2	-	-	\vdash	-	-	-	-	-
	3 4	4	A 3	1A 2A 3A	-	-	+	-	+	+	+	\vdash	+-
	6	A 4	1A 2A 3A 4A	-	\vdash	\vdash	+	+	+		-	-	+
	1	1A 2A 3A 4A 1B	-	-	╁	-	+-		+	-	+	+	-
	-		+		+	\vdash	-	+	+	+	\ \	-	Se
	min a thrond	2010	FFT	DECODE	OPERAND	EXECUTE	ADDDESS	NAC NA	NE N	MEM	WPITERACK		memory in use

Figure 3a

>	
Temory	
\mathcal{L}	ŀ
H	ŀ
Te	ľ
2	ľ
Banked M	İ
0	ľ
7	Ī
al	
Banked	
Processor with B	
it	
3	ļ
rocessor v	
O	۱
ð	,
\sim	
7	
Δ.	ı
Thread]	
ر 2	
17.6	ļ
£	١
<u> </u>	4
Four-1	•
\overline{c}	,)
Four-T	4

						4)	3	1	i	1			į)))	!				-					1		1	-	ŀ		Ì	-	ŀ	L		_
C L Decoration and	Ŀ	,	6	ļ,	-	卜。	6	-	F-	0	6	4	2	6	4	Ľ	2	က	4	-	2	ε	4	-	0	က	4	_	2	ر س	4	1 2		3 4				
	- -	2 2 4	, 5	, {	- a	_	, g	-		_		1	יו אר	1	1	5		35	45	16	2E	35	#	Ľ.	75	3F	4F	<u>u.</u>	2F	3F 4	4F 1	16 20	26 30	3G 4G	10			
7	2	ζ ς	5 6	10 20 30 40 1B	2 4		g				AB C	2 2			4C		1		35	30	9	9	1E	2E	뽔	띩	46	4E	1F 2	2F 2	2F 3	3F 4	4F 4F	ш				
15157 15157		5	4	14 24 34 4A	₹ 6				-			4B 4	4B 1C	200				01	25	20	8	30	40	E	2E	2E	끯	4E ,	#	11	11	2F 3	3F 3	3F 4F	_	_	_	
OPE DANID		T		1 4	1A 2A 3A	4	4	1	-		_	-	38 4			20	သူ	30	24 C	4C 1D	ai	2D	30	30	4	쁘	JE.	2E	35	3E 4	4E 1	<u>-</u>	1F 2F	유	3.	4		
EXECUTE		1			1 A C		34 48			-	+	-		+	m	10	2C 2C		ဗ္က	4C		10	2D		30	4		Ë	7E	.,,	3E 4	4E	-	1F 2F	_	胺	4	
ADDOE OF		T		T	-		40		_	AA	1		80	38	8 48		=	1C 2C	<u></u>	ဘ္တ	4C		ā	1D 2D		30	4D	-	1E ;	2E	(,)	3E 4	4E	<u>"</u>	2F		뚱	4F
AUCKESS			Т	T			7 4				4			2 ac	-	8 4B	+	12	20		ပ္ထ	5		2	20		æ	4D	-	1E 2	2E	က	3E 4	4E	부	75		3F
1012 101	I	T		+	T	T	5		0 0			46		1 H	-		4B	-	2	20		ဘ္တ	54		2	20		30	4D		JE 2	2E	3	3E 4E		7	2F	
WE IV			T	1	\top	T	\dagger	2		40			4 A		8 2B	+-		3 4B		2	20		30	심		Ω	8		30,	4D		1E 2	2E	38	4E		7	75
WEIN WEIN					\top	T		+		_L	8		-	4		18 28	-	_	84	+	2	2C		သွ	4C		유	Q		30 4	4	-	16 2	2E	용	4	\downarrow	느
1000						Τ	T	T	\vdash			-	-		-	_	_		_										\neg							_	_	
esi di [vicocco	g				T		-	-	-	67	ر س	6	-	-	6	-	3	-	_	_	က	က	ო		-	-	က	က	က	-	_		60	3	_	_	-	က
memory2 in use	e e					Π	1	2	2		1	-	4	2	2 2		4 4	4	2	2	7	4	4	4	7	2	2	4	4	4	2	7	2 ,	4	4 4	2	2	2
						١		١	ĺ			ļ	l		i																							

Figure 3b

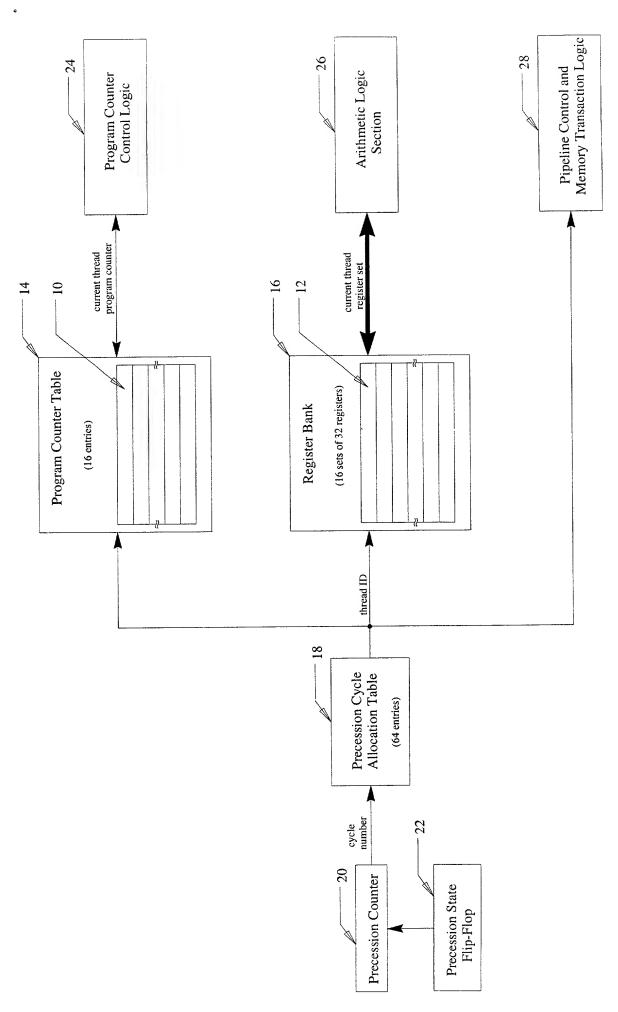


Figure 4

ε

7

Ţ

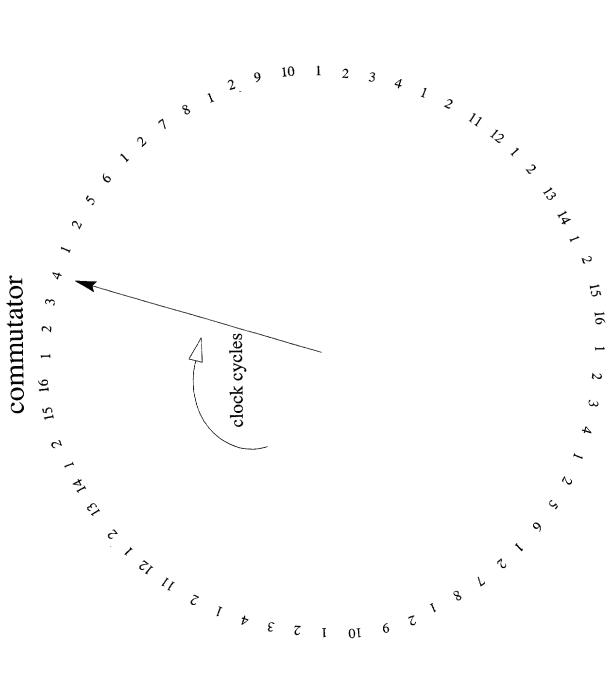
Figure 5

6

AI EI SI II OI

ςī

91



Į

10

Figure 6